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THE

DECIMAL SYSTEM,

AS APPLIED TO THE

COINAGE & WEIGHTS & MEASURES

OF

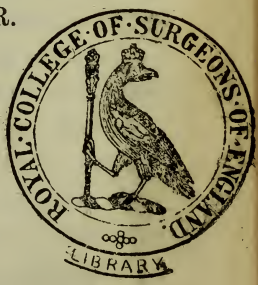
GREAT BRITAIN.

DEDICATED TO THE

Lords Commissioners of Her Majesty's Treasury.

BY

HENRY TAYLOR.



FOURTH EDITION.

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PREFACE

TO THE

THIRD EDITION.

The substance of that part of the following pages which respects the current coinage of the Realm, in its relation more especially to computation, was published originally in the 'Banker's Magazine.' The disappearance subsequently of a large reprint, leads to the hope that the object with which it was written has not altogether failed of success. A certain degree of attention has, in one way or another, been recently drawn to the consideration of a question hitherto, from obvious causes, pretty generally slighted. To keep up and stimulate whatever amount of interest may have been in any quarter excited, is the author's desire in offering another edition. He is fully aware, that in the opinion of many persons of good judgment, the realization of an improvement of the kind he advocates is more to be desired than hoped for. Unfortunately, this impression has been productive of much disinclination accurately

to weigh the intrinsic merits of a decimally-arranged scheme of money. A *popular* subject, from its very nature, it can never be. Trained and afterwards constantly practised in a particular system, not one individual in a thousand, even among what may be called the enlightened classes, thinks it worth while to consider of any other, except occasionally, perhaps, as a matter of ingenious speculation. On the abstract convenience of the decimal principle, few persons, probably, of much intelligence would be found to disagree; but, in order to examine any theory with advantage, some definite and detailed plan of carrying it out in practice is indispensable. To offer this is the leading attempt of this little Tract.

PREFACE

TO THE

FOURTH EDITION.

SINCE the publication of the last Edition, the question as to the introduction of Decimal Money has assumed a new form. It is no longer a matter of mere speculation, but to a certain extent has become one of reality; thus showing that when improvement is desired, the best course to pursue is *to ask for it*. On the 27th April, 1847, Dr. John Bowring, M.P., moved, in the House of Commons, "That an humble address be presented to her Majesty, requesting that she will be graciously pleased to authorize the issue of coins representing the value of two shillings, being the tenth of a pound sterling." An Act of the legislature followed, and a decimal piece, denominated a FLORIN, is now among the current coins of the empire. There is an end put to the question, raised by some, regarding the expediency of a new Unit. The Pound sterling, as our integer of account, is in no way to be interfered with; whilst the principle has been clearly recognised

in Parliament, that it would be advantageous, instead of continuing its present subdivision into 960 constituent parts (or farthings), that these should be extended to 1000 parts, and thus afford the means of a gradual decimal arrangement in our future circulating coins. All controversy, now, becomes limited to the best mode of effecting this object; as to which it is not surprising that diversity of opinion should prevail. In its renewed form, therefore, our little publication will chiefly be occupied by the discussion fortunately thus narrowed. The subject admits of a more careful attention than has yet been given to it; and can only be understood in all its bearings, by going into a systematic review of details. A consideration of some of these was, in fact, the occasion of a correspondence with Dr. Bowring, arising out of parliamentary proceedings. Its substance is now offered as perhaps contributing some *materials for thinking*.

As indirectly bearing on the question of Decimal Coinage, some remarks on our system of Weights and Measures are separately appended.

The Author was gratified to observe that the former editions of this little Tract supplied matter for discussion in certain of our popular periodicals. As public ends alone are those he has in view, he would be glad again to see it, in its renewed form, made use of in a similar way.

THE

COINAGE OF GREAT BRITAIN.

Among the many improvements that have of late years been introduced in our social economy, is one which, though never entirely lost sight of, has only very recently received the attention due to its practical importance, and, as many think, to our character, as the first commercial community in the world—I mean a scientific, or, in other words, a *decimal* arrangement of our circulating *coinage*. Various have been the suggestions, from time to time, for obviating the incongruities of our present unsystematical and complicated currency, in pounds, shillings, pence, and farthings. Only now and then one is to be met with who has gone into the question sufficiently to know either its details or practical bearings; and few persons appear to be aware how nearly decimal our money already is. Dry and uninviting as to many it may seem, surely a matter affecting the daily and hourly transactions of life cannot (or ought not) be without its interest; not as involving a mere alteration of *coins* required in common barter, (convenient as it would be,) but as essential to a greatly needed reform in our

entire system of *Calculation* and *Accounts:* in a word, to the substitution of *simple* for our present *compound* arithmetic. An opinion has long prevailed with many persons, that the difficulty attending a change from the duodecimal to the decimal money-scale has been greatly overrated. With a Government really *desirous* of introducing such a reform, it would seem to be a question of expediency only. Neighbouring nations have accomplished the same alteration in our time, some of them recently; and in others the process of transition is still going on. It cannot, however, be pretended that an innovation like this is to be brought about without some degree both of trouble and opposition; there will never be anything like what is termed "pressure from without" to urge it onward. Our railroads, steamers, and telegraphs are doing their work in expediting affairs in business. Does the counting-house present no field for improvement? Is it nothing that example has been set us, where the habits of the people were to the full as averse to change as they are with us? In Holland, for instance, the perseverance of the Government has triumphed over opposition and prejudice, and the decimal systems of money, weights, and measures, are there satisfactorily in operation.

Few persons, probably, are acquainted with the facts relative to this question, some of which were alluded to in Parliament by Dr. Bowring, on the occasion noticed in our Preface. "The decimal system," he says, "has made great progress throughout the civilized world.

At this moment it was used by more than half the human family; with three or four exceptions, it had been adopted by all the nations of Europe;—in the entire vast Russian empire; and through the wide regions of China, with its 300,000,000 of souls. It was penetrating into the Ottoman dominions. In Egypt and Greece it was established; in Persia and in the Brazils, as well as Portugal. It was universal in the United States of America; and had made its way into Mexico, Central America, and many other transatlantic communities." In short, we are but recurring to the primitive or very earliest mode of reckoning. Mr. John Quincy Adams, in his able report to the Congress of the United States, in 1821, on 'Weights and Measures,' says, "the division of numbers, by decimal arithmetic, is distinctly proved to have been established before the general deluge." "In our own time, considered merely as a labour-saving machine, it is a power offered to man incomparably greater than that acquired by the new agency of steam."

Fortunately for us, our existing coinage presents facilities, with comparatively little innovation, for such a rearrangement as may be made to meet the emergency. As for the common and very hackneyed argument about the useful divisors in the shilling, with its twelve parts, more has been said than it really deserves. At any rate, these are not so important as that the standing nuisance of the *Pence Table* need, solely on this account, be perpetuated. It is very usual for persons to

imagine that there can be no binary subdivisions of our circulating coins, under a decimal system of account-keeping. The fact is, that as far as real utility in small dealings is concerned, the two objects are not altogether incompatible. There is a balance of advantage to be struck; and, in the end, we hope to show that a partial combination of the decimal and binary systems is not only possible, but is acted upon practically in other countries. We need not, for a limited good, reject a more general one, and inflict upon ourselves the worry and perplexities of compound addition, subtraction, multiplication, and division, to the end of our business lives.

In our proceedings, however, every degree of deference must be paid to existing circumstances, which require that the present relative notions of value, so long associated in the public mind, should, as far as is compatible with the design in view, be prominently considered and preserved. Thus looking at the question, the Commissioners (appointed about ten years ago) on the subject of weights and measures, recommended the preliminary step of decimalising the coinage. "The facility," they remark in their report, "consists in the ease of interposing between the sovereign and the shilling a new coin equivalent to two shillings (to be called by a distinct name); and of considering the farthing (which now passes as the 960th part of a pound), as the 1000th part of that unit." In the 'Companion to the Almanac' for 1841, Professor De

Morgan calls attention to the same subject, and his recommendations are based on the principle of which the above is the outline. In the detail of his plan, Mr. De Morgan leaves unchanged the pound sterling as the unit, or integer of account. It is required by him so to divide it, that each part shall be subdivided into ten others. The primary step in doing this introduces the tenth of a sovereign, the ROYAL (our present Florin)—in fact, a double shilling. This, it is proposed, should circulate for some time, when its half and quarter would be introduced, superseding by name the old shilling and sixpence. With the exception of a gradual withdrawal of crowns, half-crowns, and fourpenny-pieces, our currency thus far would be scarcely altered, except in *names*. The next stage in the transition process presents the greatest novelty and difficulty. Here, on Mr. De Morgan's plan, is required the decimal part of a royal. This new element in our coinage he calls a *groat*, (with its half,) equal to two and four-tenths of the present penny, or $2\frac{1}{2}d.$ very nearly. The remaining coin would be a *farthing*, ten constituting the groat; discarding altogether the old penny. The new farthings are, of course, 100 to 96 of the old ones, a variation of four per cent. only, less than the constant fluctuations in the price of copper, and of no practical importance, except in large quantity. Mr. De Morgan's system is thus rendered purely *decimal*, with a name and a coin for every place of figures; and by these coins we should reckon in account-keeping.

In other words, the *denominations of account* would be *Pounds, Royals, Groats,* and *Farthings* (representing units, tens, hundreds, and thousands), in lieu of our present Pounds, Shillings (or 20th), Pence (240th), and Farthings (960th). In the 'Companion to the Almanac,' for 1848, Professor De Morgan again returns to the subject; his second paper differing in principle from the first one chiefly inasmuch as he seems desirous therein of keeping up, by *name,* the present shilling coin.

The leading principles thus laid down by the Commissioners, and by Mr. De Morgan, were urged by Dr. Bowring in Parliament, on the 27th April, 1847. Like Mr. De Morgan, he advocated the creation of two new coins of account—the *tenth* and *hundredth* of a pound. In a few matters of detail, however, a diversity appears in the two scales, Dr. Bowring thinking it practicable to retain *all* our present coins in circulation, the new ones being additional to them. We will presently consider whether such a mode of procedure would be likely to further the end in view.

Dr. Bowring's scheme was so far assented to, that the first instalment of the decimal scale of coins was ordered to be prepared. The result is before the public in the Florin coin recently issued, being the tenth of a pound sterling. Objection was at first raised by some to the term Florin, but habit is all that is needed to reconcile the ear to unusual sounds; and the similarity in value of this stranger among us to the coins of the same

name, (almost universally known in Europe,) as well as to the common half dollar, will perhaps give advantages that at first were not apparent in our insulated position. To foreigners it will doubtless afford certain facilities in understanding our money system; and we, in return, shall be brought, as it were, more into the European family. Dr. Bowring's second proposed new coin he would call a *Victoria,* corresponding with Mr. De Morgan's *Groat.* With most speculators on the subject of a decimal coinage, it appears to follow as a thing of course, that, having obtained a Florin—the *tenth,* the next step must be to make *its* tenth, or one *hundredth* of the pound. This latter coin has always been the stumbling-block in the way of reformers; and few have properly considered the main question—Do we want it at all?

We have as yet spoken of the coinage only as a medium of *daily barter;* but by far the most important consideration is *account-keeping.* Indeed, but for the sake of improving the latter, change of system would be altogether worthless. Fortunately, the masses have no very great concern in this. Still nothing is more desirable than to anticipate resistance, by avoiding every unnecessary approach to complexness. Both Professor De Morgan and Dr. Bowring have thought it essential to the decimal scheme, that our money should literally be divided throughout by tens, each tenth represented by a named coin of account. We wish to combat this idea, and to show that the innovation of an entirely new de-

nomination, like the tenth of a Florin, is too great a one for the requirements of the case. It is either too small or too large to take the place of any existing coin. In the first place, as to the coin itself, (call it what you will,) an objection arises as to its composition *material*. Copper is not eligible from its weight. In silver, as proposed by Dr. Bowring, it would be too small to be either popular or extensively useful; whilst any kind of mixed metal finds no favour at the Mint. Again, who would like a coin of account, bearing almost an entirely new relation to the old money, often requiring calculation, and whereby the chain of old association was nearly broken? Our escape from difficulty would seem to be by excluding such a denomination from our scheme altogether, and to pass by *one step* from the Florin to its hundredth. If *three* denominations of account will answer every useful end, four would be only an encumbrance. What Frenchman says 3 francs 6 decimes and 5 centimes, for 3 francs and 65 centimes? What Englishman would say 3 florins 4 victorias (groats) and 6 cents (farthings), when 3 florins and 46 cents is shorter? Our purely scientific reformers will exclaim, this is not the decimal system, but a mixture of decimal and centesimal. So much the better, if it answers the end in view, with more of simplicity and brevity. What man walks two sides of a triangle, when one will take him straight to a given object? Fortunately we are not speculating in the dark, but are in a position to profit by the experience of other nations.

Let us, therefore, here stop, and observe what our neighbours have done, or are doing, on the point of centesimal arrangement of their money scale. In France the decimal theory nominally exists,—francs, decimes, and centimes; but, practically, only francs and centimes are requisite; and all reckonings are so rendered, both there and in Belgium. The decime denomination (except as a coin of circulation) is set aside, for the greater brevity of the centesimal mode of speaking and accounting. In Russia, the rouble contains, centesimally, 100 copecks. So in Holland, the florin (or guilder) is divided, in accounts, into 100 cents. In Sardinia, some of the Swiss States, and in Greece also, the centesimal scheme alone is known in practice. And how is it in the United States? Let us again quote from the Report, before alluded to, of Mr. Adams. "We took," says he, "a dollar, and introducing the principle of decimal divisions, we said a tenth part of it shall be called a *dime*, a hundredth part a *cent*, and a thousandth part a *mille*. It is now nearly thirty years since our new moneys of account have been established. The dollar and the cent have become familiarised to the tongue; but the dime and the mille are so utterly unknown, that now, when the recent coinage of dimes is alluded to, it is always necessary to inform the reader that they are ten-cent pieces. Ask a tradesman in any of our cities what is a dime or a mille, and the chances are four in five that he will not understand your question." In fact, in that country, as elsewhere, it was found much more convenient to drop all super-

fluous denominations of account; and, finding dollars and cents answered every requisite end, the others are scarcely heard of.

If, then, some nations, who once had the denomination we are discussing, have laid it aside, and others are framing their scale without it, why should we puzzle the public, apparently for the mere object of completing a paper theory? We are even more interested in studying brevity than our neighbours, for already we have, in consequence of our large unit, one coin of account (the pound) beyond any other people, or at least more than is used by them. To their *two*, we must of necessity almost always use three denominations. The advocates for a literal decimal scale evidently assume that their *third* coin would be the one to take the place of the discarded *penny*, in small reckonings, up to the florin; so that, practically, as we now usually in accounts pass over the parts of a penny, and reckon only in the three first denominations, we should do pretty much the same in the new mode. But there is a wide difference between a denomination of 4, and of 10 farthings in this respect. Even if it served the purpose of wholesale dealers, it ill would suit the humbler classes of retailers, whose profits probably often depend altogether on the odd farthings. In our copper money, therefore, we should do wisely by looking almost entirely to the requirements of those who would chiefly have to use it. Would not these sooner learn to reckon by cents, than by the greater novelty of a $2\frac{1}{2}d.$ coin? Abandoning such a denomination of ac-

count, our course would be to pass at once down to the 100th part of a florin, which coin we will suppose to take the name of *cent*. And here again we may be met by the scientific objection, that as our integer of account is the pound, our lowest denomination ought to express its thousandth part; in other words, that *mil* is a more appropriate name than cent. Were we to resolve on retaining in our system four denominations of account, no doubt the cent coin, as the hundredth, would be the third in rank, and a fourth term must be sought, which *mil* might well enough supply, although it is one that would grate on English ears, as it did on the American.

A reference to the scale of coins we have laid down, as well as to our proposed mode of reckoning by them, will demonstrate that our lowest denomination of account, properly speaking, has immediate reference, not so much to the pound as to the florin, which would in fact become the integer in all small transactions; and from its size is better adapted for centesimal division than either the French franc or the American dollar. The American cent piece is rather less than our halfpenny, which would be too large, but that the half cent supplies a remedy. We have heard it said, that the franc is subdivided absurdly too much. The remark would with more propriety apply to the coin itself, as being too minute a unit for the degree of subdivision actually wanted. The Dutch florin is the double of a French franc, and divides centesimally much more usefully. Our own florin is larger by four pence

than its Dutch neighbour; and suitably fills the place allotted to it. A farther advantage, in the saving of a long row of figures, to express a comparatively small sum of money, is conferred by our pound denomination, which may with propriety be styled a *receiver general;* so that our money scale is capable of being rendered more convenient than any other. Respecting the word *cent,* as a term of account, none is so short, expressive, or more universally known throughout the world. Objections have been raised by some to what are deemed *foreign* names; but, after the adoption of *florin,* it would appear not a little squeamish to complain of the exotic origin of cent. The word, in fact, has been naturalised amongst us. Is it not already in every day use, when, for instance, we talk of interest, &c., at so much per *cent.*? As to continuing the term *farthing* (the *fourthing* or *fourthling* of a penny), is it not rendered ineligible by the adoption of that of florin? The initial letters being the same, confusion would sometimes arise. We may here say a word as to the utility of *brevity* in our names, and the consequence arising from an ill-judged choice: *Victoria,* for instance, would be mangled down immediately to the first syllable. And now as to *Farthing* (whether we retain three or four denominations): used to denote our lowest coin of account, as proposed by Professor De Morgan and Dr. Bowring, it would become a much more prominent affair than it has hitherto been. In short, all small valuations, below the florin, would, to save trouble, be made by it. The

association of an old farthing, as identical with a new cent, or twenty-five cents as equivalent to each old sixpence, would speedily lead to the concise mode of computing everything below the value of a florin, in *cents* alone; which an intermediate denomination would only serve to perplex and complicate both in speech and writing. As to the necessity of having thus to express ourselves in higher figures, that is a mere question of habit. It is thought nothing of in France or the United States. We do now nearly the same thing in England, from choice; when, for instance, we say 16, 18, or 20 pence, as contractions for 1 *shilling and four-pence*, &c., or 35*s.* for 1 *pound, fifteen shillings*. Could we expect a tradesman to express the sum of 3 florins 4 victorias and 7 farthings, in three terms, when he need but to say 3 florins 47 cents (shortened, in speech, to *three and forty-seven*)? It has been remarked, that in merchants' or bankers' accounts there would be no choice but to enter every amount down to the lowest point,—nothing below the penny being now noticed. This, however, is not a matter of course; but suppose it were, what can be the objection to precision, where it gives no extra trouble whatever?

In his speech Dr. Bowring says, "If a new system had to be introduced, there might be an advantage in calling farthings mils, &c.; but he was disposed to retain the old names, as facilitating the adoption of the system." No one, surely, will assert that the change from the duodecimal scale to the decimal is *not* "a new system!" Let us see whether other reformers are not

of opinion that this retention of old names, at altered values, would act in an opposite direction, and indefinitely prolong the transition process. An intelligent writer (by name) in the 'Athenæum,' who gives us the result of his personal experience in several foreign countries, where the decimal system has been introduced, among many other observations, says, "in the proposed change, the best way is to choose the plan which offers most resistance practically to any attempt to evade it. Far better is it to have no change at all than not to have it effective and complete from the first. Surely no one would willingly take us through a thirty or fifty years' purgatory of transition. The experience of continental results justifies me in laying it down as a rule, that every denomination of *account* should be represented by a *coin*. In every case where a denomination is changed, the old coin should be withdrawn, and entirely superseded by the new, else the masses *will* use it both in reckonings and accounts. By this, also, is got rid of the necessity of talking of 'old' and 'new' money. Nothing is more intolerably annoying than to have two systems instead of one, be it ever so bad. Every new coin should have a new name, which should be of easy and rapid utterance. The name and relative value of each coin should appear on its face. If you leave them the *shilling*, the masses will continue to keep their accounts by them; and they will also continue the use of the *penny*. The great mass of the people will not adopt an abstraction. You must give

them something which they can see, handle, and call by name, if you want them to reckon by it. They will adopt no change but from *inevitable necessity*." In one word, if we would have a whole people acquire a different mode of reckoning and thinking, we must do it, less by appealing to the understanding than to the senses. The public generally will learn no novel theory in any way but by the agency of new coins actually put into their hands, leaving nothing doubtful, and nothing to think about.

And now as to account-keeping, supposing the money circulation to be maintained as proposed by Dr. Bowring, viz. pounds, shillings, pence, and farthings, in combination with Queens (florins) and Victorias. Few speculators have well enough considered the practical working of any new system on *paper*. Having given the people certain coins nominally decimal, (and these will refuse nothing where the value is understood, that is put before them legally,) the rest is usually supposed to follow as a matter of course. "The beginning and end being right, the whole will come right." A recurrence to the numerous crude and impracticable theories put forth in the newspapers of the day, will attest the prevalence of this idea. Not so, however. If, as I conceive, the proposition is clear that every denomination of account must be represented by name, by a coin, the decimal elements will be sufficient for all purposes, both of circulation and account-keeping. It is natural, therefore, to inquire why the

new way of reckoning is to be mysterised by a retention of duodecimal names? Will not the public, having the coins of both systems side by side before them, take their choice in account-keeping, and use which they please, as prejudice, caprice, or ignorance may direct? Perfect national uniformity of system is, or ought to be, the end in view, and we commence by permitting the means of individual diversity.

We must look into this matter in detail: and, first, as to the penny, which is essentially a component part of the duodecimal scale, being the 240th part of the old Troy pound, and was called a *sterling*. In his reported speech, Dr. Bowring supposes this coin, in the future system, to be the "250th part of a pound," or 4 of the new farthings. Elsewhere he suggests that it might be desirable to alter it, *ultimately*, to a 5-farthing coin. Hitherto, it has been customary to believe that the binary scheme involved in the penny is the main difficulty in the way of possessing decimal arithmetic. Why then attempt a change, and give at the same time not only the temptation, but all possible facility, for evasion? Talk as long as we might, with such a penny and our old shilling remaining by name, nothing would ever be in common use but duodecimal calculation. We might in vain call the shilling and the sixpence 50 and 25 farthings, respectively, but the public would retain their own old way of believing that 6 pennies made a sixpence. If I wanted more than these, in change, I should be told to find anything

farther on *paper*. We should frequently witness the pleasing variety of having the ascending and descending scales used, the one decimally, and the other duodecimally. We may now imagine an *altered* penny—one enlarged to a 5-*farthing* coin (properly a half-Victoria); for this is proposed by some, as the means of escape from a dilemma. Here, then, is the name left, its capacity for mischief decreased, its meaning and intent gone. In vain might one strive to coax the public into calling a sixpence a *fivepence*—a coin for which Mr. De Morgan (having abandoned the penny) does not appear to have *any* name. They simply would refuse to do it. The masses are unable to theorise, and suspicion of sinister design is much more easily roused than allayed. Let us be certain that this attempted change of value, in a retained old coin, would not act with sufficient force to frustrate *any* contemplated improvement. Affection for an old public servant induces many to look, as a precedent for the retention of our penny, to the instances of France and to Holland, where, in their circulation, respectively, are still to be seen the sou of 5 centimes, and the stiver of 5 cents. The cases are not analogous. These two pieces wanted no alteration to enable them to fall decimally, and perhaps sometimes usefully, into their respective places, without much classing with system; although, as respects the sou, it is not known legitimately as a coin, the Tribunal de Commerce refusing to recognise it in accounts, except as a 5 centime piece. With us we

must remodel our penny purposely. This done, its *half* would naturally be suggested, like the half-stiver of 2½ cents in Holland. The division of a cent is immaterial there, for half-cent coins are in common use; whilst in England half-farthings are almost unknown. Let it not be asserted that the public would perceive no difference between a 5 cent piece, so called, and a penny by name of the same value. There is the old thing, altered, to talk about and blunder with, in speaking and accounts. In the *new* coins, on the contrary, a 5-cent piece would simply be one of a series, coming naturally where it was required, and productive of no more remark than any of the others.

The same argument we have used as to the penny applies to the shilling, in any new scale. Retained by name, it would ever be considered as a denomination of account, and reckonings would continue to be done by twenty in the pound instead of ten. The paramount object ought to be to put the *florin* prominently forward, as the pivot on which the improved system moved. There is an evident difficulty in reconciling the shilling of "25 half-pence" in the public mind. In speaking of the transition process, Mr. De Morgan says, "the great pinch, if it be one, lies in the odd half-penny which would go to the shilling." But where would be the "pinch," if we were to leave off speaking either of shillings or of half-pence? A shilling of anything but 12 pence would be an unfathomable mystery. Call it a *half-florin*, and 50 cents rises in the mind at once.

The intrinsic difficulty, as with the penny, is in the actual *name*. Let the masses, if they will, talk of pennies and shillings, *conversationally*. They do so, harmlessly, to this day in the United States. At the Mint, therefore, under the new system, nothing ought to be known but the half and the quarter of the florin, or 50 and 25 cent pieces, as in Holland, &c. These coins would, probably, soon become familiar under the shortened names of "Halves" and "Quarters," (or Quarts).

Having endeavoured to show that even were we to retain the old coins at all by name, they must each be in some way altered to adapt them to the change of circumstances, every consideration of expediency seems to say, "abandon them for those that alone express the new ideas." Let us have only such as we can reckon by in one way, and that the right one. What then becomes of the plea, that the old coins would present "associations of value, and facilitate the adoption of the decimal system?" If it is worth while to alter at all, ought we not to go the whole required length, and aim, without timidity, at the possession of a scale, complete at once within itself, and so escape an indefinite prolongation of purgatory? In a change like the one under consideration, the work of pulling down an old system is far more difficult than that of building up another, and every prop must be removed before it will fall.

As to the future copper coins, convenience to the public, and especially the most numerous portion of it, must

direct our proceedings. For their use a greater variety of small money than we now possess might be desirable. Perhaps we cannot do better than provide 1, 2, and 5 cent pieces (or centers). A 3 center, also, would be requisite with the odd numbers; and this piece would confer the farther advantage of enabling us to have a tolerably near approach to divisional *thirds* (enough for most common purposes), as 33 and 66 cents. Regarding a *Ten*, we have seen that it presents some little difficulty: two *Fives* would answer the same end, and be usually preferred. But a silver *Fifteen* center would be useful, as a substitute for our present *four-penny* piece. Every coin ought to have its value and name marked upon it. Some might desire to retain the crown, or *quarter-pound*, whilst others believe that a *three-quarter* florin piece would be more approved, in point of size, than coins so large as either crowns or half-crowns. The first of these, indeed, no one carries farther than to the nearest convenient place, to get it changed into smaller money. And so it would be were the absurd proposal carried out of issuing a lumbering double-florin. The half-crown is tolerated for the convenience of its sixpence, in change; but this, a three-quarter florin coin would equally afford. Those who are old enough will well remember, on this account, the popularity of the eighteen-penny Bank-tokens, circulated some years ago. The lowered prices, also, of most common articles of life, have so far changed the

value of money, as to warrant a reduced size in our coins, both silver and copper. Reference has already been made to a feeling in favour of the advantages in common transactions conferred by the binary divisions of the duodecimal scale of money. But few persons seem to recollect that the decimal plan also partially admits of this convenience. Have we not the half and fourth of the florin, interfering in no way with decimal-account keeping? In the United States, the binary divisions of the dollar are (or were) carried as far as eighths and sixteenths. Mr. Adams says, "We have the halves, quarters, and twentieths, and might have the fifths. The eighth, dividing the cent only into halves, adapts itself without inconvenience." In that country, *half-cent* coins are in circulation. With us the eighth would scarcely be expedient, for we should require the anomaly of a $12\frac{1}{2}$ cent piece. In point of fact, below the quarter florin, every needful facility is conferred by our proposed small coins, available in any required form of combination. Suppose we take the extreme case of the eighth of a florin: in all common dealings 12 cents would well enough represent it, for no one ever now thinks of halving a farthing.

In order, at one view, to be able to compare the old and new coins of circulation, and those of account, respectively, the tables following will show them, side by side:

Old Coins of Circulation.		*New Coins of Circulation.*			
				s.	*d.*
Gold.	Sovereign.	*Gold.*	Sovereign 10 Flor.	20	0
	Half Ditto.		Half Sovereign . 5 „	10	0
Silver.	Crown.	*Silver.*	Florin 100 Cents,	2	0
	Half Crown.		Three-Qr. do. . 75 „	1	6
	Shilling.		Half ditto 50 „	1	0
	Sixpence.		Quarter ditto . . 25 „	0	6
	Fourpence.		15 Center 15 „	0	$3\frac{3}{4}$
Copper.	Penny.	*Copper.*	Cent	0	$0\frac{1}{4}$
	Halfpenny.		2 Center	0	$0\frac{1}{2}$
	Farthing.		3 Center	0	$0\frac{3}{4}$
			5 Center	0	$1\frac{1}{4}$

Old Coins of Account.				*New Coins of Account.*		
Farthing.				Cent.		
1	Penny.			1	Florin.	
4	1	Shilling.		100	1	Pound.
48	12	1	Pound.	1000	10	1
960	240	20	1			

We may now stop to consider what portion is likely to be realized, as regards common circulation, of the confusion which it has been common to represent would be the concomitant of a reconstructed money system. Let it be imagined, that all the present coins in the pockets of the first fifty persons we might meet, were by some means changed at once, piece for piece, into the proposed new ones; what practical difference could it make to one of these individuals? Every coin, silver or copper, would be stamped with its relative value, each having its counterpart, or nearly so, in those now in use; nor would the small supposable clashing at first, from the 4 per cent. difference in the copper, sensibly alter

the price of a single common article. The holder of any large quantity of copper money need not lose by it; the Mint being bound to receive it back at its value, when issued. Old *names* would linger on for a while, if that is important; but as far as mere innovation in our coins is concerned, we have had much greater in the eighteen-penny, three-shilling, five-and-sixpenny, and seven-shilling pieces, besides Spanish dollars, that were, in our own time, blended with the circulation. But none of these were probably more generally convenient than are our new Florins; and nothing would sooner conduce to the habit of reckoning by tenths of a pound, than to place them in liberal supply before the public. In this, as in everything else, if we wish the people at large to learn a new system, the means must be furnished. They will never acquire it till the coins themselves enable them to do so.

One part of the parliamentary debate, in which reference was made to the question of depreciated value under the new system, requires a passing notice. We might well have left this fallacy to its own refutation, had not the doctrine derived importance, coming as it did, confessedly, from two magnates of the Treasury, who might have been supposed to understand the subject. It is much easier to excite the working classes into a belief that the wages of labour would be lowered, than to dispel so unfounded a notion. If, indeed, the undesirable scheme were followed out, as suggested by some, of coining, what might be termed depreciated

pennies, of four of the new cents, (4 per cent. less in value than the old farthings,) and obligations contracted under the old scale, were offered to be paid exclusively in such pieces, there might be some pretence for dissatisfaction. But wages, like everything else, would find their own level; and no one would have cause to complain because these were paid in new half and quarter florins, in lieu of old shillings and sixpences.

It is scarcely to be contemplated that a legislature, having taken one step towards the decimal plan of coinage, can remain for any length of time insensible to the calls that will be made upon it to proceed farther in the same direction. If the Government should see reason to doubt the necessity of creating, by any name, such a coin as Dr. Bowring's Victoria, is the farther interference of Parliament required? Having the counterparts of the half and quarter florin coins (shilling and sixpence,) already in circulation, does it require an act to alter their *names?* As regards the copper pieces, these are generally considered only as mint *tokens.* Does not expediency seem to point out that to *them* our next step in the process of new coinage should be directed, beginning at the bottom of the series?

As our decimal coins became common in circulation (with a corresponding decrease in the present existing ones), we should soon see the advantage, and indeed necessity, of reckoning and keeping accounts by them. At the outset it would, perhaps, be occasionally a little

perplexing; but a few days' practice would suffice to convince any tolerable accountant of its convenience and simplicity. We have thus far devoted our attention to the consideration of the scheme of decimal coinage, as brought before the Parliament, and in part assented to by the legislature. From certain portions of that scheme, the remarks made will show dissent, to explain which it became necessary to state the reasons at considerable length. Mere generality is scarcely sufficient for the object, in a matter only to be properly considered in its minute details. In such a question these become, in fact, important points. The remaining portion of our investigation relates to the mode of *using* the proposed new money. Suppose a person for the first time receiving a sum in the decimal coins (on the scale exhibited at p. 28). The sovereign remains unaltered, and with the florin he is familiar, so that he has but to learn the use of cents. Let him forget, if he can, every thing about shillings and pence, and of such numbers as 20, 12, and 4. He must think solely of pounds, florins, and cents, and the numbers 10 and 100. In short, he must dismiss from memory the pence table, and substitute for it the numeration table. He has only to bear in mind that a cent is equal to an old farthing, till we reach 25, or a *quarter*-florin (old sixpence); 50 cents, a *half* (old shilling); 75 cents, a *three quarter* (old eighteen-pence); 100 cents, a *florin* (two shillings). He will observe that all his new money, below the florin, is marked as to its relative

value in cents, easily reckoned up. The first supposed coins in his hand are two sovereigns and eight florins; the sum £2 8*f.* 0*c.* is to be written, instead of the present £2 16*s.* 0*d.*, its equivalent. He receives an additional *quarter* piece, when the sum is put down £2 8*f.* 25*c.* (old money £2 16*s.* 6*d.*) The addition of a *three-quarter* piece would make up £2 9*f.* 0*c.* To this latter sum of coins some new copper money is supposed to be added—as two 5 *centers*, a 2, and a 1 cent coin; increasing the total to £2 9*f.* 13*c.* Another *half* would make £2 9*f.* 63*c.* (£2 19*s.* 3¼*d.* old money). Let us show, and add up a sum composed of a series of other amounts, similarly computed and carried out, viz.

£	*f.*	*c.*
2	9	63
27	3	75
17	0	37
£47	3	75

It may here be observed, that many persons would accustom themselves to write this £47. 375, which is often convenient in doing sums. But an adherence to our familiar three divisional lines in account books, would usually be preferred; and this method seems to be more in accordance with our proposed mixed decimal and centesimal arrangement. Taking the above sum, £47 3*f.* 75*c.*, if we require to convert it into florins, we have but to omit the first divisional comma, and we shall have 473*f.* 75*c.*, (473¾ florins.) The removal of

the other comma gives us in cents, 47375, without altering a figure. Should we wish to know the 10th, 100th, or 1000th part of £47 3*f.* 75*c.*, or to ascertain its multiples of 10, or 1000, the examples following will show that the transposition of the figures is all that is needed to give us (fractions omitted) the required results, respectively :

	£	*f.*	*c.*		£	*f.*	*c.*
Divide	47	3	75	Multiply	47	3	75
10th	4	7	37	10 times	473	7	50
100th		4	73	100 ,,	4737	5	00
1000th			47	1000 ,,	47375	0	00

Let the accountant take the corresponding sum, in old money (£47 7*s.* 6*d.*) and see the amount of trouble and number of figures necessary to arrive at the same respective results, in our present compound arithmetic.

Professor De Morgan, in allusion to his plan of a decimalized coinage says : "If the preceding scheme were looked at all at once, it would appear liable to a great deal of confusion. But, in order to judge of it fairly, it must necessarily be looked at in detail ; and it must be asked how much of this plan is in operation at once ? What quantity of change is required to be learned at any one time, that is, in any one year ? We will now state a few of the advantages of a perfectly decimal coinage.

"All computations would be performed by the same rules as in the arithmetic of whole numbers.

"An extended multiplication table would be a better interest table than any which has yet been constructed.

"The application of logarithms would be materially facilitated, and would become universal, as also that of the sliding rule.

"The number of good commercial computers would soon be many times greater than at present.

"All decimal tables, as those of compound interest, &c., would be popular tables, instead of being mathematical mysteries.

"When the decimal coinage came to be completely established, the introduction of a decimal system of weights and measures would be very much facilitated, and its advantages would be seen."

We will now place the two systems in contrast, by giving an exemplification of *pounds, shillings, pence, and farthings,* brought into *pounds, florins, and cents.* Annexed to the amounts, new and old, are given the number of coins (the pounds being excluded) requisite to pay or receive them, respectively. In doing this, the shortest are used on both sides, with the exception of crowns, which might be common to either scheme; and, on the whole, it seems probable that considerable economy in coining would result from the adoption of the decimal system of money. This is a point quite worth more investigation than it has received. In order farther to illustrate the convenience of the decimal plan, a few common calculations and sums are given in the usual rules of *Compound Arithmetic,* as pertaining to the present coinage; contrasting with each, the corresponding calculation in the new money, in *Simple*

Arithmetic, with the number of figures respectively employed. This latter, however, is not the only criterion of advantage, as a practised hand will perceive that the old method not only involves a larger degree of thought and trouble, but requires many more figures often than are shown, with a corresponding liability to error. The relative totals will not in all instances be perfectly equivalent, owing to the small 4 per cent. variations, unnoticed, in the old farthings and new cents.

Before, however, we proceed to these, it would be expedient to acquire facility in converting the old money into new; or inversely, the new into old. A reference to the table following will show how readily this is to be done, either way; and in a short time all that is requisite will present itself to memory. It is not pretended that the figures are in every instance mathematically correct, but minute fractional parts are not commonly necessary, and therefore foreign to our present purpose. The new and old money are placed side by side. As far as 25 *cents*, (old sixpence,) these are reckoned as farthings. Above 25, and under 50 cents, (old shilling), it will be perceived, have an additional cent, over and above the number of farthings, given to each sum. Above 50, and under 75 cents, (old 1*s*. 6*d*.) two cents are requisite. Above 75, as far as 99 cents, three will be wanted. The superadded cents are of course required to make out the difference in value, —96 old farthings being the equivalent of 100 new cents, (florin.)

d.	Cents.	*s.*	*d.*	Cents.	
¼ . . .	1	0	9 . .	37	
½ . . .	2	0	9½ . .	39	
¾ . . .	3	0	10 . .	41	
1 . . .	4	0	10½ . .	43	
1½ . . .	6	0	11 . .	45	
2 . . .	8	0	11½ . .	47	
2½ . . .	10	1	0 . .	50	Half
3 . . .	12	1	1 . .	54	
3½ . . .	14	1	2 . .	58	
4 . . .	16	1	3 . .	62	
4½ . . .	18	1	4 . .	66	
5 . . .	20	1	5 . .	70	
5½ . . .	22	1	6 . .	75	Three-quarters.
6 . . .	25 Quarter.	1	7 . .	79	
6½ . . .	27	1	8 . .	83	
7 . . .	29	1	9 . .	87	
7½ . . .	31	1	10 . .	91	
8 . . .	33	1	11 . .	95	
8½ . . .	35	2	0 . .	100	Florin.

Individuals differ frequently as to the readiest mode of proceeding in arithmetical calculation. To some persons it might be useful, in bringing the old money into new, to see whether the method following might not often facilitate matters; though, after a short practice, it will surprise many to find they can do all that is needed without any adventitious aid, or even a pen. The plan, here laid down, supposes the accountant to see instantly, after noting the number of florins, what remainder there is, in quarters (old sixpences), *each of* 25 *cents*. These being added, what will then be left will only, on an average, be a trifling sum, easily reduced in completion of the amount.

£	s.	d.		£	f.	c.		d.		c.		£	f.	c.
1	2	8	=	1	1	25, and	2	—	8	make		1	1	33
3	17	$5\frac{1}{2}$	=	3	8	50, „	$5\frac{1}{2}$	—	22	„		3	8	72
2	13	$10\frac{1}{4}$	=	2	6	75, „	$4\frac{1}{4}$	—	17	„		2	6	92
7	4	$7\frac{3}{4}$	=	7	2	25, „	$1\frac{3}{4}$	—	7	„		7	2	32
3	19	10	=	3	9	75, „	4	—	16	„		3	9	91
5	7	0	.	.	.	.	.	.	.	.		5	3	50

To bring the new into old money, we may reverse this method of proceeding.

£	f.	c.		£	s.	d.		c.	d.			£	s.	d.
1	1	33	=	1	2	6, and	8	—	2	make		1	2	8
3	8	72	=	3	17	0, „	22	—	$5\frac{1}{2}$	„		3	17	$5\frac{1}{2}$
2	6	92	=	2	13	6, „	17	—	$4\frac{1}{4}$	„		2	13	$10\frac{1}{4}$
7	2	32	=	7	4	6, „	7	—	$1\frac{3}{4}$	„		7	4	$7\frac{3}{4}$
3	9	91	=	3	19	6, „	16	—	4	„		3	19	10
5	3	50	.	.	.	.	.	.	.	.		5	7	0

£	s.	d.	Coins.
8	2	0	2
7	1	6	2
2	7	0	4
5	0	$6\frac{1}{2}$	2
4	12	$1\frac{1}{4}$	5
1	6	8	5
6	2	$3\frac{3}{4}$	7
3	16	$2\frac{1}{2}$	7
38	8	4	34

20

768 shillings.

12

9220 pence.

4

36,880 farthings.

£	*flor.*	*cts.*	Coins.
8	1	0	1
7	0	75	1
2	3	50	2
5	0	27	2
4	6	5	3
1	3	33	4
6	1	15	2
3	8	10	6
38	4	15	21

384 florins, 15 cents.

38,415 cents.

Deduct 1,535 4 per cent. difference.

36,880 cents.

	£	s.	d.
From ..	25	2	$5\frac{1}{4}$
Subtract	17	9	$8\frac{1}{2}$
	£7	12	$8\frac{3}{4}$

	£	flor.	cts.
From ..	25	1	21
Subtract	17	4	85
	£7	6	36

	£	s.	d.	
Multiply	58	17	$1\frac{1}{2}$	by 35
			11	
	647	8	$4\frac{1}{2}$	
			3	
	1,942	5	$1\frac{1}{2}$	
	117	14	3	
	£2,059	19	$4\frac{1}{2}$	

38 figures.

	£	
Multiply	58	856
by		35
	294	280
	1,765	68
	£2,059	960

26 figures.

Multiply				
£	s.	d.		
562	10	4	by	125
		10		
5,625	3	4		
		10		
56,251	13	4		100 times
2,812	11	8		5 times
11,250	6	8		20 times
£70,314	11	8		

49 figures.

Multiply		
£		
562	516	
by	125	
2,812	580	
11,250	32	
56,251	6	
£70,314	500	

37 figures.

	£	s.	d.
Divide by 6)	331	15	$7\frac{3}{4}$
	£55	5	$11\frac{1}{4}$

	£	
Divide by 6)	331	782
	£55	297

Divide by £	s.	d.	
456) 3,252	16	$2\frac{1}{2}$	(£7
3,192			
60			
20			
456) 1,216			(2 shillings
912			
304			
12			
456) 3,650			(8 pence
3,648			
2			
4			
10	£7	2s.	8d.

55 figures.

Divide by £	£		
456) 3,252	810	(7	133
3,192			
60	8		
45	6		
15	21		
13	68		
1	530		
1	368		
	162		

43 figures.

79 lbs. at $5\frac{3}{4}$d. per lb.

d.	£	s.	d.
4	1	6	4
1		6	7
$\frac{1}{2}$		3	$3\frac{1}{2}$
$\frac{1}{4}$		1	$7\frac{3}{4}$
	£1	17	$10\frac{1}{4}$

21 figures.

79 pounds at 24 cents. per lb.

	316
	158
£	1,896

14 figures.

1,149 yards at 18*s.* 6¾*d.* per yd.

s.	*d.*	£	*s.*	d.
10	0	574	10	0
5	0	287	5	0
2	6	143	12	6
1	0	57	9	0
0	0½	2	7	10
0	0¼	1	3	11
		£1,066	8	3

40 figures.

1,149 yards at 928 per yard.

	9	192
	22	98
1,034	1	
£1,066	272	

27 figures.

Cwt.	lb.	£	*s.*	*d.*
50	55 at	4	13	10 per cwt.
				10
		46	18	4
				5
		234	11	8
		2	6	11
			4	8¼
		£237	3	3¼

36 figures.

Cwt.	lb.	£	
50	55 at	4	691 per cwt.
			50
		234	550
		2	345
			234
		£237	129

29 figures.

THE

NATIONAL WEIGHTS AND MEASURES.

THE preceding pages have been occupied with the consideration of the Coinage of Great Britain. We would now direct attention to our National Weights and Measures. The state of these has been a fertile subject of legislative interference from the signing of Magna Charta, which declares that "there shall be one weight and one measure," down to our own time. Act has followed Act, from 27th Edward III, nearly 500 years ago, with these words, "We will and establish, that one weight, one measure, and one yard, be used throughout the land," and still we are to this day without uniformity. The truth is, we are but beginning to come to any practical conclusion as to the real intent and meaning of the terms "one weight and one measure;" whether, as some have contended, actual uniformity of *identity* was meant, or only uniformity of *proportion*. In other words, whether two or three things, as gallons or pounds, under one term, but bearing only an under-

stood proportion, relatively, as to quantity, were entitled to be considered but as *one thing*. In this conflict of opinion we have gone on, century following century, with weights and measures varying as to contents, but agreeing in a common name; understood to mean, in a certain trade or profession, one thing; in another, something else; opening the door, if not always to direct fraud, at all times to confusion in the aggregate. Whilst thus doubting as to the construction to be put upon words, there was little to be done but to continue enacting, mending or mutilating as the case might be, and in the main, leaving the average state of matters much the same, in practical results, as we found it, so far as anything like *system* or science was concerned.

Within the last quarter of a century a principle has, however, been laid down, as we shall show, and in part carried out in practice, that goes far towards clearing the way to a more satisfactory state of things. To urge on the course of improvement in this path is our present design, with the ultimate view of introducing, what we have hitherto never had, an *Imperial Scale of Weights and Measures*. Numerous are the publications on the subject of the Metrology of Great Britain, from the earliest periods; but our object at this time leads us not so much to investigate the past, as to point out the actually existing state of things; combining with our suggested amendments such incidental advantages as arise in the course of our proceeding. Of these, perhaps, none would be more important than the principle of *uniformity*, fully

carried out, in combination with that of *decimal arrangement*. To many real friends of improvement there is something rather alarming in the term "decimal system," and more especially as applied to weights and measures. It seems to mean some mighty upsetting of all established things; a kind of rooting out of old habits and beginning again with new ideas of value and proportion. Moreover, we have been advised not to urge the state of the national *weights and measures* on the attention of government, at a juncture when our legislators have positively taken a direct step towards the establishment of a decimal *coinage*. The wheels having, after the consideration of half a century, been set in motion, we are warned that no clog must be put upon them by pressing new matter, lest we stop short altogether. But setting aside any present intention of embarrassing our rulers by unseasonable importunities, is there nothing in the meanwhile to teach the *people?* no way of educating them, at least, in habits of thinking? I am old enough to recollect an observation, made forty years ago, that for the discussion of the decimal system we must await the spread of *education*. Another forty years of silence would find us precisely where we now stand. But is the question immediately before us one legitimately arising out of what is called *education* at all? We must endeavour to define what we really want, and whether it is anything beyond a matter of common legislation for the good ordering of trade and commerce, like numerous other corresponding regulations, in which

the masses never yet did, in any country, nor ever will actively interfere. We desire farther to show, (supposing we were never to see a change of system as regards our coinage,) that, with our *present money*, advantages of an important amount would result in calculation from a decimal scheme of weights and measures.

We have been accustomed to hear so much as to the difficulties attending an improvement of this kind that we must of necessity go into several matters of detail, in order to show how the question really stands, not only as connected with the coinage, but apart from this. We may put aside the crude theories that have been promulgated occasionally by certain projectors about pounds of money, miles of length, acres of land, &c., all having their corresponding decimal divisions by *Dimes*, *Cents*, and *Milles*. Those who advocate a scheme like this would do well to propose at once the adoption of the entire ready-made French scale, as was thought of many years ago in the United States of America. On that occasion (1821) proceeded the elaborate Report to Congress, on the state of the national weights and measures, by Mr. John Quincy Adams, a production unequalled for the extent of information it conveys on the subject to which it relates, and quite as applicable to ourselves as to his own country. Fully alive to the merits of the French system, Mr. Adams adhered to his opinion that this monument of science would ill bear transplanting into a foreign and ungenial soil; that legislatorial enactment was unequal to the magnitude of such a task; and he

considered it more expedient to continue the use of the miscellaneous system of weights and measures the United States had inherited from the father-land. His recommendations appear in the main to have been followed, and in America there is little departure from the old received scales. Indeed, the example of England has been always copied pretty generally, and the changes made by our recent enactments have almost literally been adopted by the United States. In this respect, therefore, we are so nearly situated alike that it needs no apology if we refer occasionally, as we propose to do, to the opinions and researches of Mr. Adams.

It may be well, previously to detailing our projected scheme of improvement, to see how we now stand as to our national weights and measures. Three or four kinds of these, often understood but in one locality or trade, exist to puzzle, and sometimes to mislead us altogether. Can any intelligible reason be given why bullion, drugs, groceries, and wool, should continue to be estimated by as many different scales of weights? Who can fathom the mysteries of the Pharmacopœia? Ounces and drachms may signify, in a druggist's shop, quantities varying in two or three ways. Eight drachms of apothecaries' weight may mean an ounce of 480 grains, whilst eight drachms fluid measure are but $437\frac{1}{2}$ grains, still called an ounce. If a recipe is given to mix, it is necessary to learn to what profession the writer belongs before it can be made out what kind of drachm is intended, and even then there is no certainty. It may be 60, 27-34375,

or 54·7 grains. A pint of apothecaries' measure may contain sixteen ounces, or twenty ounces avoirdupois. In other cases the apothecary uses the troy ounce of 480 grains. In short, so vague is the term pint, and so differently measured, that it has frequently become necessary to abandon it, and reckon by the fluid ounce.

Suppose we turn to the trade in corn, how are the uninitiated to make out the relative prices of our London and provincial markets? A cursory inspection of a few provincial corn lists and circulars will show quotations of prices made in every variety of way, from the Mark Lane quarter to the Scotch boll, the firlot, the load (of different kinds), the coomb, the last, the barrel (of various weights), the ton, the cwt., the pound. Wheat is quoted sometimes per quarter, per 20 stone, per 14 stone, per 480 lb., 70 lb., 60 lb., and 62 lb. Barley, by the barrel of 14 stone, per 400 lb. and 392 lb. Oats, per barrel of 14 stone, per 312 lb., 320 lb., and 45 lb. Indian corn, per quarter, per ton, per cwt., per 20 stone, per 480 lb., and 196 lb. Beans, per quarter, and per 65⅓ lb. Flour or meal, by the sack, the ton, per 280 lb., 196 lb., or 240 lb. Oatmeal, per boll, per 240 lb., and 261 lb. Seeds, even of the same kind, are priced in a variety of ways; as the quarter, the cwt., the ton, the last, and the barrel; and some of these mean different quantities, even in the same market.*

* An exemplification of the practical working of our present corn measures may be worth giving, for the edification of the uninitiated. What follows is a portion extracted from an actual

In the meat markets, also, much variety and confusion exists; the farmer selling in one place by the stone of 14 lb., and in another, of 8 lb. In Smithfield, the latter only is known; and it is curious to find how the Act 5 and 6 William IV, is set at nought. To evade the penalty for using illegal weights, by an understanding between the salesman and butcher, the word "stone" is dropped, but the term "eight pounds" is retained as its substitute. In the same way, what are called long and short weights, and several other local terms are continued, contrary to law.

Committees in parliament have, from time to time, investigated this complicated subject, with a view to correction; and commissioners were severally appointed for the same purpose, and for verifying the national standards of weight and measure, in 1814, 1819, and 1838. From these we had several valuable reports.

account-sales of a cargo of foreign wheat, very recently sold on commission in one of our ports.

Received per the ————, 7584 imperial, or 7506 per 60 lb. bushels.

Sold 6426 bushels per 60 lb.
1060 do. per 62 lb.
13 do. imperial.

7499 or 7517 per lb. bushels.

To pay the duty on the above, it was converted into imperial *quarters;* and again, it was brought into *tons*, to calculate the tonnage and other dues. Here are five different ways of measuring or computing a single cargo of wheat in one port! If we have no reverence for the declarations of Magna Charta, we ought, at least, to compassionate the foreign merchant now that we permit him to send us his corn.

The members of the last commission were MM. Baily, Bethune, Gilbert, Lefevre, Lubbock, Peacock, Sheepshanks, and Herschel. That much carelessness as to the state of our national standards had previously existed, no one can doubt who reads the description given by the late Mr. F. Baily, (afterwards a commissioner,) of the standard yard measure at the Exchequer. "It would be impossible to speak of it," he says, "with too much derision and contempt. A common kitchen poker, filed at the ends by the most bungling workman, would have made as good a standard." The report of the commissioners, made in 1841, after reciting that the standard yard measure was rendered useless by the fire at the House of Commons, and that the standard troy pound weight was altogether missing, recommends a plan to procure others;—that the standard of capacity be in future ascertained by weight, not by length; that the avoirdupois pound, and not the troy, be the standard; and affirming that nothing would contribute so much to the introduction of a decimal scale of weights and measures as the establishment of a decimal *coinage*, which is recommended. Public attention having thus been drawn to the subject, our standards of every kind have in consequence been defined with the utmost care; accurately adjusted, and kept beyond the reach of future casualty.

The general result of the labour and experiments of these several Commissioners has undoubtedly been to throw much light on what was previously obscure, and

often uncertain. The legislative enactments principally emanating from them, may be said to be comprised in the Acts 5th George IV (1824), and 5th and 6th William IV (1835). Some of these provisions are of much importance, as we shall presently see. One set of Commissioners recommended that the *Troy* pound should be continued as the nominal standard of weight. A succeeding set of Commissioners, however, reversed this recommendation. It is not surprising that difference of opinion on this point should prevail, for although the great bulk of the transactions of the country is done in Avoirdupois weight, still the Troy pound is used almost exclusively, by two large and influential bodies in the community, both jealous of interference; viz., the Bullionists, and the Medical profession. Another difficulty presents itself, in the fact that the Avoirdupois pound has no constituent parts of its own. To ascertain *it*, as matters now stand, we must have recourse to *Troy* grains, of which, by Act 5th of George IV, it is declared to contain 7000. In point of fact, large commodities only are, strictly speaking, applicable to the Avoirdupois pound, as such; and we are compelled to resort to the Troy, or lesser weight, in estimating bullion, and small articles in pharmacy. The custom, doubtless, had its origin in times when the Troy weights were identical with the coins. In the conflict, therefore, of two distinct units, by one name, (originally adjusted, respectively, in proportion to each other, of 5760 to 7000; and in relation to the different specific gravities of wheat

and spring-water,) consists the confusion hitherto operating to defeat all attempts at a uniform system of weight, by means of a single scale. These two coexisting pounds of weight are now the sole remains and representatives of a fanciful theory, dating back as far as Magna Charta itself, and which we shall presently see has, as respects *Measure*, already received its death-blow. To this state of things therefore it is, that we should turn our attention, and see whether the time has not arrived when the pound *Troy*, having survived its original intent, may be altogether abandoned, as a part of our system.

From whatever cause, the Commissioners we have alluded to do not appear to have thought it their duty to do more than throw out certain suggestions for alterations in our weights and measures; or of partial improvements, "which," says Professor De Morgan, "it is perhaps fortunate were not adopted." The great leading question, therefore, as to the establishment of a uniform series of *Imperial Weights and Measures*, is still in reserve for the future consideration of the legislature; and no one, surely, can be liable to the imputation of presumption, who, after much deliberation, ventures to urge in its favour whatever arguments can be educed. In so doing, it is necessary that we understand on what principle our theory of change is founded; what is the amount and extent of alteration required, to adapt our present scales to our future wants; what parties will be affected by it; whether the foundation

of the decimal scale is not, to an important extent, actually laid; whether a very large portion of the difficulties, real or imaginary, attending an altered system, and the consequent charge to individuals, and the country at large, have not already been met; and, finally, whether the changes necessary to complete what has been begun, are not likely to be less formidable than those already accomplished in placing us in our present position.

It is necessary to premise that, in laying down our scheme, we wish to draw a line between alteration for useful objects, and change, creating confusion, without adequate necessity. Our inclination leads us, therefore, to look entirely to the utilitarian principle; seeking to found a symmetrical scale of decimal weight and measure, altogether based on *existing units*.

We have seen that the Commissioners, in their Report, recommended the adoption of the Avoirdupois pound, as the future standard of weight. With this in prospect, the imperial gallon now in general use was established by Act 5, George IV, in which it is declared to contain 10 pounds, Avoirdupois, of distilled water, weighed as therein detailed, being a vessel of 277,274 cubic inches capacity. By the instrumentality of this new unit of measure, will eventually arise more important consequences than probably even its originators contemplated. Had this opportunity, therefore, not been taken advantage of, the difficulty of all future improvement would have been indefinitely increased. The Commissioners

preferred to create a new measure altogether, to selecting for retention any of the then co-existing ones, and which might have defeated the objects in view. Instead of three distinct gallons, for Wine, Ale, and Corn, respectively, based on the specific gravities or bulk of Bordeaux wine, English ale, or grains of wheat, we have now a single Imperial Standard Gallon, established by reference to a certain weight of distilled water, on the immutable basis of mathematical principle. More than this has been effected. The controversy as to the meaning of Magna Charta, agitated down to our own time, has been cut short, by the decision of the Commissioners to construe the words "one measure" literally. We have no longer a large gallon for bulky articles, and a smaller for less or more costly ones, but the principle has been fixed as to universal identity of capacity, leaving all other things to be adjusted in *money*, between buyer and seller. As a natural consequence, from the Imperial Gallon proceeded the Imperial Bushel measure; and thus was effected the suppression, for all legal purposes, of the old Winchester, and every other conflicting bushel.

To carry into effect this, our newly established unit of capacity, required no common exercise of authority. Every dealer throughout the kindom, wholesale or retail, by Act 5, Geo. IV, was compelled to alter the size of his measures of business; the brewer his casks; the wine-merchant his vessels and bottles; the retailer his pots, pints, &c., to the lowest degree; the farmer his

bushel; and, consequent upon this (as a larger measure), the very sacks for his corn. Everywhere there was more or more less of change, and Imperial Measure is now universal.

It is necessary to revert to all this, in proof, that a very large proportion of the difficulty, trouble, and outlay in establishing the basis of the decimal system, has already been incurred. The expense to the nation, to parishes for standards, and to individuals (with grumbling in proportion), was enormous; for a general revision of our weights, and of the standards of linear admeasurement, as defined by the Commissioners, took place at the same time. What remains, is to follow out and complete that which has been well begun; establishing uniformity in *weight*, as we have already done in relation to *measure*.

We are thus brought to the consideration of the Avoirdupois Pound, upon which is indissolubly based the Imperial Gallon. No effort that can ever be made by the wildest innovator will be of any avail to separate them, or in superseding these units by any other. As there is now, for the first time, an Imperial *Measure*, decimally constructed, so there must be a corresponding standard of Imperial *Weight;* putting an end to the perpetual paradox of a whole not equal to all its parts; with the specific names, the ounce, the drachm, and the grain, "indefinitely applied," as Mr. Adams expresses it, "as indefinite parts of an indefinite whole."

We have shown that already the Avoirdupois Pound is the unit on which our system, so far as we have any, is based; but to adapt it for the farther objects in view, it must be reconstructed as to its divisional parts. At present, it is declared by Act 5, George IV, to consist of and contain 7000 *Troy* grains of weight, thus deriving its constitution from the parts of another scale. What is there beyond what is merely conventual or comparative in the number 7000? The proposition, we would make, therefore, is to subdivide the present pound Avoirdupois into 10,000 units of basis, thenceforth calling it the *Imperial Pound*. The substitution of 10,000 for 7000 constituent parts would not only be favorable to the interests both of business and science, by giving a smaller unit, but from no other number would it be possible to reconstruct our scale at all; much less on the principle of decimal division and accretion. The Act to which we last alluded prescribes the mode of recovering, or ascertaining the pound weight, by reference to a cubic inch of distilled water; and no doubt this method might be rendered as applicable to 10,000 Imperial as to 7000 Troy grains.

It now remains to give a tabular view of the united results of the principles of weight and measure we have thus endeavoured to lay down; following out, universally, to its legitimate end, the recommendation of the Commissioners, "that the standard of capacity be that of weight." Much confusion of ideas has arisen from a

prevalent notion, that a changed or decimalised scale of weight and measure involves essentially a new nomenclature. Exaggerated views of difficulties connected with this, have led many well-intentioned reformers to believe that improvement is hopeless. Our design is to alter names as little as possible. Nothing more perplexed our French neighbours than the nomenclature of their new weights and measures. This formed with them by far the greatest part of the difficulty. It was literally Latin and Greek put before those who understood neither. Probably the system could by no possibility have been introduced, had not the government given way to necessity, and allowed the people to call new things by old names; even when the *quantities* were not the same. "Give the people," says Mr. Adams, "but their accustomed *words*, and they will call 16 a dozen; 120, 112, or any other number, a hundred." With us, in England, it has always been so. Let the masses have a *stone*, and it may signify 5, 8, 10, 14, 16, or 32 pounds, as you please, according to particular callings: in fact, variety has hitherto been the rule—uniformity the exception. "Human nature," continues Mr. Adams, "is everywhere the same. In the ordinary operations of the mind, distinctness of idea is limited with the chain of association between sensible images and their habitual denominations, more closely than with the exactness of logical analysis." Accordingly, we think it a matter of inferior importance, that in our tables the old and new terms sometimes express quantities

little in correspondence. We may here, however, remark, that to many it might appear incongruous to retain the term *grain*, as the unit of a pound weight, no longer bearing reference, as of old, to grains of wheat or barley. Those who take this view of the case, would probably substitute in preference the word now used to denominate the lowest unit of measure,—the *Minim*. This would give uniformity to our proposed scale, at the same time, that possible error might now and then be avoided by confusing the old and new grain. One term, now in use, must necessarily be omitted; and our choice is between the retention of the word *penny-weight* or that of *scruple*. We have taken the latter, as being the shortest, and, perhaps, on the whole, now the least unmeaning. The same nomenclature prevailing both as to weight and measure, (liquid or dry,) it may be well to point out the necessity for using the prefix *meter*, when *capacity*, and not weight, is intended. This, indeed, is no more than is done now, when we speak of *fluid* ounces, pounds, &c.

IMPERIAL WEIGHTS.

Grain or Minim							
1	Scruple						
10	1	Drachm					
100	10	1	Ounce				
1,000	100	10	1	Pound			
10,000	1,000	100	10	1	Stone		
100,000	10,000	1,000	100	10	1	Cwt.	
1,000,000	100,000	10,000	1,000	100	10	1 (or Quintal.)	
							Ton.
10,000,000	1,000,000	100,000	10,000	1,000	100	10	1

IMPERIAL MEASURES OF CAPACITY (LIQUID OR DRY).

Cubic Inches.			
—— 28	1 Minim		
—— 277	10 Minims of water are		1 Scruple-meter
2,773	10 Scruples	„	1 Drachm-meter
27,727	10 Drachms	„	1 Ounce-meter
277,274	10 Ounces	„	1 Pound-meter
2,772,740	10 Pounds	„	1 Gallon
27,727,400	10 Gallons	„	1 Hundred-meter (or Firkin)
	10 Firkins	„	1 Butt.

It will be observed that the *ton* of our table is carried out decimally, as 10 hundred-weight. In the eyes of some practical persons it would probably seem best to retain the customary ton of 20 cwt. Be this as it may, in the event of such an alteration, there would be little either of inconvenience or mystery in reckoning two for one. This new ton of 1000 pounds would represent 16 cubic feet of spring water. The *hundred-weight*, like all other weights, has varied considerably at different periods. Under the decimal scale it would of course be reduced to its legitimate 100 *pounds*, as is now the case in some of the United States; though in others, it is still retained as 112 pounds. In book-keeping all mention of *quarters* (now terms of account) would cease; and reckoning would be done, with great simplicity, centesimally, in hundred-weights and pounds. The *stone* might readily be established uniformly at 10 pounds, instead of the present statute 14 pounds, as declared by Act 5 and 6, William IV. This weight varies considerably in different localities or trades. A stone of glass is 5 pounds; of meat and fish in London,

8 pounds. The latter stone doubtless had its origin in the statute of 1496, as the eighth part of a bushel by weight (8 gallons = 64 pounds), formerly partially used. Two such gallons, or 16 pounds, still is a stone of cheese; whilst 32 pounds (or half the weight of the said bushel) is a stone of hemp. Our proposed decimal scale would restore the *drachm* to its original number of 100 to the pound, when used as money.

It might be expected that in a new arrangement of measures, those should come under review usually employed in the wine, spirit, or beer trades. In all of these the imperial gallon alone is now used. The present custom, as relates more especially to beer, commonly is to keep the accounts in *gallons*, *firkins*, and *barrels* of 36 gallons. A change to the decimal mode of computation, (though not absolutely essential,) is easily made, by substituting *butts*, in accounts, for barrels,—the *firkin* (a measure of great antiquity) would be altered from its present nine to ten gallons, as in our table; and the butt, from 108 (formerly 126 gallons, or $3\frac{1}{2}$ barrels) to 100 gallons. The other measures or vessels used, as kilderkins, barrels, hogsheads, and puncheons, would become merely the convenient aliquot parts of the butt, as indeed they now are among brewers. Besides these, are various denominations of casks, chiefly employed for wine and spirits, as kegs, ankers, runlets, tierces, pipes, and tuns; but these may be considered rather as the names of the vessels in which such commodities are sold, than as expressing any definite number of gallons.

It is the practice in general to gauge all such casks, and to charge them according to their actual contents in imperial gallons. In the same way, the common useful divisional portions of a gallon,—the quarter, or quart ($2\frac{1}{2}$ pounds-meter), and the pint ($1\frac{1}{4}$ pound-meter), &c., would remain unaltered, for retail purposes; although, under a decimal system of reckoning, they would not rank as terms of account, in the way they now do.

The trade in corn, &c., is of such general extent and importance, and so much diversified by local custom, that it would be a vain task to reconcile the mode of measuring and computing it invariably by the scale laid down in our table. Nor is this a matter essentially necessary. We have seen how important were the results attendant on the establishment of the imperial gallon, of which eight constitute the *Imperial bushel.* Of these bushels, eight make up the measured "London Quarter" of corn, &c., formerly equivalent to a *quarter* of a ton weight of wheat. By this standard is regulated everything connected with the revenue; and in most parts of the country the law has enforced the use of the Imperial bushel, so far as individuals are concerned. But there still remains a vast deal of contrariety as regards the provincial corn marts, for the government has at all times exerted its authority reluctantly in interfering with long established customs in our corporations, guilds, or markets. When it is considered that no more than a quarter of a century has elapsed since all our former gallon and bushel measures were superseded by

an entirely new one, it is not much to be wondered at that uniformity has only as yet partially supplanted the local habits of century after century. But the time is probably not far distant when it may be found for the public interest that the present anomalies should be got rid of.

As to well-founded objection to any kind of general reform, that it is an interference with the common affairs of business—what has been the object of the dozens of Acts of Parliament that have been passed in particular reference to weights and measures, but constant and ineffectual interference to put a stop to mystery and fraud? What honest man is the worse for it? And why have these enactments failed in their object? but because no principle has hitherto been laid down of sufficient simplicity and worth to command the suffrage of all classes in its support. That the government *can* accomplish any reasonable scheme of improvement when it chooses to set about it, it were absurd to doubt. When, for instance, it was in contemplation to grapple with the evils that till of late existed in the coal trade, we heard much, from interested individuals, of the supposed difficulties in the way of a beneficial interference. But the legislature wrought a compulsory cure, by substituting the sale by weight for that by measure; and we now hear nothing of the old chaldron, with its attendant abuses.

We have shown that a very important point was gained by generally carrying out the principles laid down by Act 5 of George IV, and that the largest portion of

the expense and trouble attending an altered system was actually at that time incurred. It remains now to examine what other changes must be made, and what difficulties are still to be met, in fully accomplishing the farther improvements we have been detailing. We ought to bear in mind that no class of tradesmen has concern beyond the small share of alteration appertaining to its own particular calling.

Beginning with the mercantile or manufacturing class, or those whose business is of a wholesale character, the changed value of the hundred-weight and ton would entail little greater inconvenience than a readjustment of prices to altered quantities. The Act 5 and 6 William IV (1835), compelled a reduction of the hundred-weight, universally, to 112 pounds. It had previously, in many districts and trades, been 120, and sometimes 122 pounds. The ton, also, in some cases had been more than the usual 20 hundreds of weight. Contracts and engagements of one kind or another were affected by the change, for the adjusting of which the Act makes provision. No more trouble or expense would have resulted (and, probably, a less amount of dissatisfaction) had the decimal hundred (100 pounds) at that time been insisted upon. A change made by two steps, when one would have sufficed, involves necessarily a second amount of inconvenience, more or less in degree; but the feeling that it must now inevitably be a final adjustment, and the certainty of increased facilities in accounts, would go far to stifle

any fresh kind of opposition. By the last-named Act, the legal stone was settled at 14 pounds, as the eighth of the hundred-weight. In the great central market of Smithfield, an attempt was made to carry the statute into effect and set aside the old stone of 8 pounds. But the experiment failed entirely. The words of a salesman, extensively engaged in business, is quite confirmatory of the opinion, that had a decimal 10 pound stone weight been instituted, the difficulty would have been a mere trifle. "The abrupt substitution of 14 pounds for the 8 pounds weight (or fourteenth part of a cwt.), was far too great an innovation for the trade. 14 pounds, too, is unmeaning—either too large or too small for general utility; nor is it any advantage, that it is an aliquot part of a cwt. In Smithfield, therefore, the Act is a dead letter, for business is still done per *Eight pounds*. Ten pounds would be a good weight; and its convenience would introduce it pretty readily. It represents, moreover, the exact Imperial Gallon of water (as the 8-pound stone formerly did the gallon of wine); a coincidence that would sometimes be useful."

Amongst the class of retailers, as grocers, &c., the change to a decimal scale would be felt in no way beyond the necessity of possessing a few small new *weights*. We may here allude to a prevalent idea, that this alteration would involve new combinations of weight as to quantity, and so be practically inconvenient to retailers and the public. No doubt, in

France this was the case, till the Government relaxed in favour of permitting a partial return to the binary mode of subdivision. With us, a combination of this in *retailing*, and of the decimal mode of *account-keeping*, is too obvious to need comment. Pounds, halves, and quarters would remain undisturbed in the business of every kind of shop. The ounce weight, altered to the tenth, in lieu of the sixteenth of a pound, with price in correspondence, would scarcely excite more than a passing remark from the lowest apprentice.

We have alluded to the retail dealers of liquors, and liquids of whatever kind, who, by the Act of 1824, were compelled to change every description of measure for those derived from the decimal Imperial Gallon. With them the work of reform is, therefore, already done. The remark just made, as to the continued use of the binary mode of subdivision, applies with equal force to the tradesmen now alluded to. They need no alteration in their present familiar and long-established measures of quantity, or divisional parts of the gallon; as halves, quarters or quarts ($2\frac{1}{2}$ pounds), and pints ($1\frac{1}{4}$ pound), &c. The only probable innovation would be that of a meter of a *Pound*, or tenth, for occasional convenience. In this connection we may again quote the words of Mr. Adams: "The experience," he says, "of France has proved, that binary, ternary, duodecimal, and sexagesimal divisions, are as necessary to the practical use of weights and measures as the decimal divisions are convenient for calculations resulting from them; and that no plan for introducing the latter can

dispense with the continued use of the former. In that country, the decimal divisions of the law became snares to the honesty of the seller, and cheats upon the wants of the buyer."

The Act 5 and 6 William IV, enacts that all articles, sold by weight, shall be sold by Avoirdupois weight, except *Gold*, &c., and *Drugs by retail*. So far therefore, as general trade is concerned, the usages of the dealers in the articles last mentioned alone interpose between a scale based throughout on scientific principle, and one in which two conflicting pounds prevent all approaches to uniformity of identity.

The regulations of the Bullionists, as incorporated, are doubtless founded on the obsolete principles of a remote antiquity; but the power that at one period established the price of Gold at £3 17*s*. 10½*d*. per *Troy* Ounce, could, at another, alter it to a standard value, based on the *Imperial* Ounce; and this, combined with the Government operations connected with the Mint, would go far to introduce generally into the trade the Imperial weights. The Medical and Pharmaceutical colleges and guilds present other obstacles to a reformed scale. These influential bodies would move very reluctantly out of their long-accustomed track. The testimony, however, of many individuals of the medical profession, especially the younger portion, and certainly that of the retailers and dispensers of drugs, tends entirely to show the practicability of a beneficial and convenient change. With all these, there appears no more serious difficulty to encounter than that involved in altered

editions of their usual Dispensatories, or books of reference. Neither in retailing nor dispensing medicine should any weights or measures be allowed, other than some one of those contained in our tables.

The occasional aid at first of a simple table of the old and new scales might be useful, bearing in mind that 7 Troy Grains balance in weight 1 Imperial Scruple. In the following table are given the relative proportions in old grains and Imperial minims :—

	Troy.	Avoirdupois.	Imperial.
Pound.....	5760	7000	10,000
Ounce	480	437-5	1000
Drachm....	60	27-34375	100
Scruple....	20		10 *

* As regards medical prescriptions, and recipes generally, under a new system, a saving of trouble might result were they written, as they sometimes are in France, without reference to any particular *weights*, by name ; but only in proportional *parts* relatively to each ingredient. In this way there would be no occasion to take any thought as to *names* or scales, new or old. Our meaning will appear on reference to the *Conspectus of Pharmacopœias*, published with the ' Pharmaceutical Times.' We may show one example, taken from thence at random, as an extract from the Paris Codex.

Kermes preparé par la voie séche.

Sulphuret Antimony	500 parts = 5 drachms	imperial.
Carbonate Potash .	1000 parts = 1 ounce	,,
Sublimed Sulphur .	30 parts = 3 scruples	,,
Water . .	10,000 parts = 1 pound	,,

It will be seen that we have annexed the equivalent proportions (not quantities), expressed in the proposed new imperial weights of our tables, in order to show the extreme convenience and simplicity of the decimal mode of division. Here is no calculation required—not even a pen needed, to make up, *proportionally*, a French prescription (or any other written decimally) by our own weights.

To those who believe the possibility of change to the decimal system depends chiefly on the question of extended national "education," it may be well again to say, that by far the largest amount of innovation involved in it, would appertain to the class of men, probably as a body, the most advanced in this respect of the entire community. In fact, is not this the *real* "difficulty?" Is it too much to say, that, with our medical and pharmaceutical professors rests the question as to the establishment of the scale of decimal weights and measures?

We may now pause to see some of the practical advantages that might be obtained in business, and especially as regards *calculation*, were the principles thus laid down realised in practice. Supposing an amount

cwt. st. lb. oz.

of weight to be 22 5 9 2, and we wished to know the number of ounces, the *same figures* inform us, (as they do in the French system under other names,) without any calculation, that there are 22,592. The addition of a figure will give us 225,920 *drachms*, and so on to *grains*. But were we desirous of knowing the number of cwts. *avoirdupois*, in 225,920 drachms,—we must divide by 16; by 16 again; then by 28; and after-

cwt. qr. lb. oz.

wards by 4, to arrive at the answer, 7 3 14 8. In apothecary's weight, to find the pounds contained in 21,880 grains, we must do a pretty long sum to make

lb. oz. dr. sc.

out the reply, 3 9 4 2; whereas in decimals we

should see, without even the use of a pen, that it was

lb. oz. dr. sc. g.
2 1 8 8 0. We need hardly remark that in all cases of multiplication or division, the *simple* rules of arithmetic only are necessary, instead of the *compound* ones at present requisite.

Let us now show the united effects of decimal money and decimal weights or measures, as applied to calcula-

lb. oz. dr. sc.
tion. If we take the last sum, 2 1 8 8, at a cent per scruple, the value in money would be known, *without changing a figure*, at £2 188; or, at a florin per scruple, £218 8*f*. At 15 cents per drachm for any article, we should perceive at once that we must give 150 for an ounce, 15 florins for a pound, £15 for a stone, and for a cwt. £150. Again, if 1 cwt. cost £133 200, it would be equally clear that a pound weight was worth £1 332, and a drachm (without fractions), 13 cents. Or, if a butt of wine (of 100 gallons) was valued at £115 700, a firkin (of 10 gallons) would be £11 570, or a gallon, £1 157.

cwt. st. lb. oz. dr.
Suppose 2 1 3 9 5, at $1\frac{3}{4}$ florin (175 cents) per oz., we should require only the following very simple sum to know the cost, viz.:

1 florin .	213	9
Half . .	106	950
Quarter .	53	475
5 drachms .		87
Total	£374	412

Now, let the accountant compare with this the amount of calculation necessary for ascertaining the cost of

cwt. st. lb. oz. dr.
2 1 3 9 5 by *avoirdupois* or *apothecary's* weights, at 3*s.* 6*d.* per oz.

We may give one other example. If 1 cwt. (weight or measure) cost £253 740, it is apparent at a glance of the eye that a stone, or a gallon, would be worth £25 374; a pound, £2 537; and an ounce, (without fractions,) 253 cents; whilst on our present system of money and weights, if we wish to make out the price of an ounce, when 1 cwt. costs £253 14*s.* 10*d.*, we must go through the whole of the following process to get 2*s.* 10*d.*, the answer:

112	253	14	10	
8	20			
896	1792) 5074 (2			
2	3584			
1792	1490			
	12			
	1792) 17880 (10			51 figures.

Thus far we have been showing the convenience, in calculation, of a decimal scale of *weight* and *measure*, supposed to be established in combination with decimal *money*. We will now turn our attention to the advantages in accounts we should possess, even with our coins retained as at *present*, a matter seldom as much as even thought of. In short, we must see whether we ought to lay such stress upon one merely incidental point, as

to lead us to overlook another, already within our reach, and quite of itself sufficiently important, without waiting for that which may not arrive in our own time, if at all.

To exemplify our meaning, we will proceed by taking the same instances, as respects decimal weights and measures, we have just given. In this way we shall the better be enabled to make comparison.

lbs.	oz.	dr.	sc.
2	1	8	8

at a farthing per scruple, is immediately shown to be £2 5*s.* 7*d.*, by simply dividing 2188 by 4, 12, and 20. At three pence per scruple, it only requires the dividing of 2188 by four, and £27 7*s.* 0*d.* is the result. At $3\frac{3}{4}d.$ per drachm for an article, an ounce would of course be ten times this sum, or 3*s.* $1\frac{1}{2}d.$: a pound would be seen, without the use of a pen, to be £1 11*s.* 3*d.*: a stone, £15 12*s.* 6*d.*; and a cwt., £156 5*s.*—If 1 cwt. cost £133 4*s.*, a stone (without fractions) would be valued at £13 6*s.* 5*d.*; and a pound, or hundredth, £1 6*s.* $7\frac{3}{4}d.$; whilst a drachm would be the hundredth of this, or $3\frac{1}{4}d.$ If a butt of wine (100 gallons) were valued at £115 14*s.*, a firkin would cost £11 11*s.* $4\frac{8}{10}d.$, and a gallon £1 3 $1\frac{3}{4}d.$ Suppose

cwt.	st.	lb.	oz.	dr.
2	1	3	9	5,

at 3*s.* 6*d.* per ounce,

	2139	5
	3/6	
	6417	
	1069	6
5 drachms	1	9
20)748	8	3
Answer £374	8	3

30 figures.

Let the same sum be done in the present avoirdupois, or apothecary's weights, as a contrast to the above. If we require to know the cost of a stone, a pound, or an ounce, respectively, when 1 cwt. comes to £253 14*s.* 10*d.*, the following process will exhibit all these (putting aside fractional sums), scarcely requiring the use of a pen.

£	*s.*	*d.*	
253	14	10	1 cwt.
25	7	6	1 stone.
2	10	9	1 pound.
0	5	1	1 ounce.

We have here, in 17 *figures*, not one result only, but *three* distinct ones; ascertained with an amount of trouble not worth thinking of. Now contrast this with the round-about process we have given, at page 68, to find out the cost of an ounce, using our *present* weights; when it will there be seen that 51 figures are requisite to show but *one* result. To complete the comparison, let the accountant try how many figures (additional to the 51) he must use, to ascertain separately, the two other results, viz., the cost of a stone (avoirdupois) and of a pound. But we should much undervalue the advantages in accounts, afforded by weights and measures decimally divided, were we to look no farther than the mere saving of a large number of *figures*. Is it possible to over-estimate the important item of extra *mental labour* (with a corresponding liability to error), necessary in computation under the present complicated system? These examples might be multiplied to any extent; but we trust our position has been maintained,—that we need not allow our zeal for the cause of decimal money to

blind us to the certain advantages, *even without this*, of a scale of Imperial Weights and Measures.

Before bringing our remarks to a conclusion, we may again repeat that our sympathies have nothing whatever in common with those reformers, who would lay down universal laws for all possible and impossible objects: thrusting the decimal principle upon things incompatible with it. Taking this view, we avow our incompetence to understand what is to be gained by a general upsetting of every old accustomed land-mark, and interfering with existing modes and measures of computation, as respects linear extension, solidity, circumference, or surface. "Decimal arithmetic," observes Mr. Adams, "is a contrivance of man for computing numbers; and not a property of time, space, or matter. It belongs essentially to the keeping of accounts, but is merely an incident to the transactions of trade. Nature has no partiality for the number ten; and the attempt to shackle her freedom with them will for ever prove abortive." "To the mensuration of the surface and the solid, the number ten is of little more use than any other. If decimal arithmetic is incompetent to give the dimensions of most artificial forms, the square and the cube, still more incompetent is it to give the circumference, the area, and the contents of the circle and the sphere." And again, "the new metrology of France, after trying the principle of decimal division in its most universal application, has been compelled to renounce it for all the measures of astronomy, geo-

graphy, navigation, time, the circle and the sphere; to modify it even for superficial and cubical linear measure." With us, all these varieties of mensuration are, in fact, but so many diversified applications, modes, multiples, or accretions, in one way or another, of our standard yard measure (now so well defined), be the same called as they may,—ells, hands, fathoms, roods, acres, or miles. All that is needed, is that these things should every where convey one and the same idea as to relative quantity, which at present is not always the case. The commissioners in one of their reports, hint at the desirableness of establishing a measure of 1000 yards possibly with a view to the old Roman mile (mille); or ultimately to found upon it some decimal mode of linear or itinerary mensuration. For the sake of argument, we might suppose that all the mile-stones in the kingdom were moved and fixed 1000 yards apart, instead of 1760; that by some undefined method of compulsion, ten inches should measure a foot, and ten feet a yard: what would be the gain to counterbalance an incalculable amount of inconvenience and confusion? Mr. Adam asks, "where is any standard of measure to be found comparable with an English foot rule, universally known throughout the world?" The practical divisions of the inch are, at option, binary or decimal; for common purpose, the first; and for scientific and revenue objects into tenths and hundredths. Let any one sit down for half an hour, and endeavour to estimate the consequences of changing, in a perceptible degree, this,

our yard measure, for any other standard of mensuration. Almost every book in our language must be re-written to be intelligible; every map and chart would be obsolete. The mechanic, traveller, historian, geographer, naturalist, navigator, astronomer, the architect, saying nothing of the men, countless in numbers, in every possible variety of trading pursuit,—all would be involved in one indiscriminate mass of chaos. But we need pursue no further any comment on a project, probably seriously contemplated by no one.

Taking our stand, as we profess to have done, on the basis of practical utility, it only remains to consider whether the time has not arrived, when the state of our National Weights and Measures ought to receive the attention of the legislature, with a view to nothing short of their final settlement. Our conviction has been stated, that the question, thus narrowed, is not attended with remarkable difficulty; that it is one to stand on its own merits, and unconnected with any contemplated alteration of the coinage. It is altogether a concern for a parliamentary Committee, or Commission; and to be considered without reference to any other object. There will arise no popular cry in favour of an altered system; and hitherto our learned and scientific bodies have shown no disposition to stir actively in the matter. Would not prudence therefore point out, in the first instance, the expediency of merely, by statute, *legalizing* a decimal scale of *Imperial Weights and Measures;* leaving its application to particular classes, to be dealt with as

circumstances and opportunities might afterwards direct?

We have so frequently quoted the lengthened Report to the American Congress, by Mr. J. Q. Adams, that it may not be thought irrelevant to conclude with a passing notice of a subject, in a degree connected with it, and directly affecting not only the United States, but the customary modes of weighing and mensuration practised in other nations. The following resolutions were passed at a meeting of the "American Association for the Advancement of Science," held at Harvard University, Cambridge, Massachusetts, August 14, 1849. President Prof. Joseph Henry, Smithsonian Institute, Washington.

"*Committee of Weights and Measures.*—Resolved 'That a Committee be appointed, to consider the practicability of introducing a universal system of scales, and standards for scientific measurement.' — Resolved 'That this Committee be directed to correspond with other Societies in this and foreign countries, and report at the next meeting of the Association.' "

A reference to Mr. Adams's Report will show that the foregoing Resolutions partially revive an idea that he notices; and which formed, in fact, the basis of a correspondence with several nations, when it was by some thought desirable to introduce the French system entire into the United States. It is impossible not to go with Mr. Adams in his expressed wish to retain all that is mutually convenient in two countries like England and America, intimately connected, no less by a common origin, than by

arge and increasing commercial ties. The question, herefore, would be as to the expediency of the introluction into either nation (what Mr. Adams so much deprecated), of fresh sources of *diversity*. It becomes important to consider the desirableness of drawing a line etween standards of weight and measure for scientific bjects, and those for commoner occasions. Ought not *ll* to be equally based on science? Would not the perecting and carrying into practice of a decimal scale, for very purpose, be a nobler aim, than anything of an xclusive or sectional character? Would England, or merica, take the French scale, or any portion of it? Vould France exchange (wholly or in part) a system hat has cost her the labour of more than half a century establish, for that of any other people? Difficulties e presented at every turn; for the question is a worldide one. Fortunately, the decimal principle is extending self; and this alone, if generally adopted, would give calculable scientific facilities. It needs not that the rench, English, or any *other* national scales, should resent actual uniformity of unit, so long as a comon *principle* pervaded, enabling comparison between tion and nation to be readily made. If, then, niversal identity of scale is clearly impossible, is not e next best alternative that which would in its opetion embrace a large and increasing portion of the man family? Suppose we confine our views to e *Anglo-Saxon race*, wherever found upon the face of e globe; and, with no more innovation than is re-

quisite to effect the object, endeavour, by joint co-operation, to unite these our common brethren, in the use of an improved scheme of weight and measure, so comprehensive in its adaptations, as that future change should not be required.

A complete set of IMPERIAL WEIGHTS AND MEASURES, *agreeably to the scale laid down in the preceding pages, has been manufactured for the grand Exhibition of* 1851, *by* Messrs. WARNER, *Jewin Crescent, Jewin Street, London.*

C. AND J. ADLARD, PRINTERS, BARTHOLOMEW CLOSE.